CLAIMS

Having described my invention in sufficient detail, I consider it innovative and therefore wish to claim exclusive ownership of the content by means of the following claims:

1. A steam-liquid heat exchanger comprising a steel duct which has on its outside at top left a steam inlet for injection of clean steam, on its top right an air bleed for draining the equipment, and on its bottom right a steam outlet. Inside, the duct has 130 steel pipes through which the stillage circulates, said pipes being supported by risers with separating partitions to stop the pipes from bending, wherein the duct connects at its top on the outside to a cleaning valve which is a steel flange for eliminating the fouling incrustations on the insides of the pipes when the exchanger is in operation. The valve can be connected and disconnected in accordance with the need to clean, and the duct has on the bottom on the outside a stillage feed head which is a T-shaped steel flange through which the stillage is injected on its way to the exchanger. The stillage feed head is also removable.

2. A stillage evaporator comprising an elbow, which is located at the top to connect to the evaporator with a cyclone, and a vapor lock lid to avoid internal pressure and accumulation of solid material on the walls of the evaporator, the vapor lock lid having an inlet on top on the right-hand side so that the cleaning operation can be performed and on the left-hand side a safety valve to release pressure during the evaporation operation. This lid is connected to a cylinder which has inside it a duct or tangential inlet which is where the steam passes through that was previously generated in the exchanger, on its way to the evaporator. The duct is connected to a shock wall. The cylinder is joined to another conical connection

cylinder, the purpose of which is to reduce the area of contact in the lower part of the equipment. The conical connection cylinder is connected to a T-shaped pickup pipe which is a steel flange that connects to the evaporator with the exchanger, thus sealing the stillage feed head of the exchanger. The pickup pipe is a container for receiving the concentrates where these drain out, characterized by the fact that the cylinder has inside it a steel filter that when packed forms a bed for attenuating the internal pressure which is the result of fouling by the scattered material therein. The steam passes through the filter and all the solids are eliminated. A shock partition made of stainless steel causes the steam coming from the duct or tangential inlet to hit the partition, producing the effect of increasing the steam velocity to 149.98 m^3/min.

3. A process for treating residual stillage generated by distillation in the tequila industry wherein it is characterized by the following steps: the first step is "reception and storage of stillage" and it begins with reception of the residual stillage generated in the distillation and mashing specifically of the alcoholic beverage tequila. The stillage which comes from there varies between 80 and 85°C, retaining its physical and chemical characteristics such as temperature 84°C, pH 3.2, biochemical oxygen demand 15,200 mg/liter, total solids 17,368 mg/liter, soluble biochemical oxygen demand 21,100 mg/liter. The stillage with these characteristics is discharged into a 1^{st} storage tank which is connected to a recirculation pump to keep the stillage mixing inside the 1^{st} storage tank until the stillage solids are in a homogenous state. The time the stillage remains in the 1^{st} storage tank varies, but can be between 10 minutes and 25 minutes maximum and will depend on the load of stillage which is produced in the distillers and mashers. The speed at which the homogenous state is obtained will depend on the type of

recirculation pump used for the type of discharge, for example: for a load of 0.11 m^3/hrs - 110 liters/hour a vertical type centrifugal pump 6000-8000 mg/liters will be needed. The second step is: "Separation of solids". The recirculation pump is connected to a solids decanter, and the former sends the stillage in a homogenous state to the solids decanter, which through the centrifugal force generated by the revolutions of the motor (optimum rpms are 2300/minute) and the operating conditions lead to a decrease in 1°C in the temperature, causing the solids to separate out from the liquid. It takes about 2 seconds from the time the stillage enters the solids decanter until separation is achieved. The solids then move into one of the ends of the solids decanter and the liquid is collected or carried by a collecting channel. The solid that emerges therefrom is converted to a semi-dry paste with a relative moisture content of 18%. On the other hand the liquid obtained contains a final solids concentration of less than 8 ppm mg/liter. The liquid stillage, having been rendered free of solids, goes on to a 2nd stillage storage tank with a 22,000-liter capacity, equipped with steam coils for maintaining the stillage under optimum temperature conditions. Once the operating level of 15,000 liters has been reached, the stillage is pumped via a stillage transfer pump to the next step in the heat exchange. The third step: "Heat exchange". The stillage transfer pump sends the liquid stillage with low concentration of solids (less than 8 ppm mg/liters) and with a temperature of 83°C to a heat exchanger, where clean steam coming from the boilers is injected, controlled by a disk valve at a pressure of 3 kg/cm. The steam obtained from the exchanger is sent to the stillage evaporator, the evaporation time being 2 to 3 seconds. The steam is injected by means of a duct with tangential inlet which upon hitting the partition experiences the tangential effect therein and due to the speed of evaporation of the stillage in the exchanger, the steam reaches an operating pressure of

3 kg/cm^2, a velocity at which the impact against the partition generates spiral turbulence, the intensity of which increases the weight of the particles, thereby causing them to sediment, and thus a steam is obtained with the quality of water vapor. The time it takes for steam to be generated in the evaporator is from 5 to 10 seconds, attaining a temperature of 110° to 130°C. The fine solids obtained in the steam generation stage are deposited in the bottom (2j) of the evaporator and are mixed into the fatty solids obtained in the solids decanter. The fourth step: "Evaporation". The steam obtained from the stillage evaporator is sent through an elbow to a cyclone for a second purification treatment process which will yield steam with the quality of water vapor. The cyclone gives rise to the same tangential effect achieved in the evaporator or evaporation chamber, since the steam enters the cyclone at a pressure of 3 kg/cm^2 the impact of which within the cyclone generates turbulence and causes the fine residual particles to deposit, thus obtaining a steam having the quality of water vapor. At this point in the process, a temperature transmitter is kept inside the processing plant to ensure that the steam generated is kept in a range of 130-140°C, thus ensuring that traces of alcohol are eliminated through the air venting line and that the steam does not contain any volatile elements. Then the steam having the quality of 100% water vapor is injected into a steam head at a pressure of 3 km/cm^2 into the steam line and is sent on to the mashers and rectifying stills or even to the cooking ovens. The head is a steam distributor where the steam coming from the boilers is channeled to all the services in the plant.